Instruction Manual

HARRIER 15/80

HARRIER 18/80

Refrigerated

CENTRIFUGE

READ BEFORE USE!

Models:- **MSB080.CX1.1**
MSB080.CX1.5
MSB080.CR1.K
MSB080.CR1.H
MSB080.CR2.H
MSB080.CR2.K

71100-1378-11
0206

MSE (UK) Ltd
Health and Safety at Work

MSE (UK) Ltd is required under the Health and Safety at Work Act 1974 and other UK legislation as designers, manufacturers, suppliers and importers of articles for use at work to ensure that, as far as is reasonably practicable, articles which we design, produce, supply or import are safe and without risk to health.

We are required to provide information on the safety and handling precautions to be observed when installing, operating, maintaining and servicing our products. Such advice is contained in this manual.

We are also obliged to update this information should circumstances change and to operate a system to this end.

We should also like to point out, however that **you as users have an important responsibility in the provision and maintenance of safe working practices and conditions.**

Accordingly, we draw the following matters to your attention:

1. **This apparatus should only be used as intended and within its design parameters by suitably qualified and trained personnel who have read and understood the relevant sections of this manual.**
2. **This manual should be readily available to such personnel at all times.**
3. **In addition to that which is written in the manual, normal common-sense safety precautions must be taken at all times to avoid the possibility of accidents. Particular care is required when working with apparatus at high temperature or pressure.**
4. **Installation, maintenance, repairs and servicing should only be carried out by an MSE (UK) Ltd approved engineer, and connection to electrical supplies should only be carried out by suitably trained personnel.**

TECHNICAL SUPPORT, WARRANTY SERVICE AND MAINTENANCE

UK customers; if you are in any doubt whatsoever regarding the correct use of this apparatus, or if you require any technical data or assistance, please contact the MSE (UK) Ltd Technical Support Department at:

MSE (UK) Ltd

Worsley Bridge Road
Lower Sydenham
London
SE26 5AZ

Telephone **+44 (0) 870 609 4097**
Fax **+44 (0) 208 650 8408**
E-mail: **sales@mseuk.co.uk**
Web Page: **www.mseuk.co.uk**

OVERSEAS CUSTOMERS: Should contact their local MSE (UK) Ltd Distributor, details can be found on our website.

ELECTRICITY SUPPLIES: Voltage and frequency
MSE (UK) Ltd electrical apparatus is offered and labelled for one, or for a choice of two or more voltage ranges and, where necessary, different frequencies of mains supply. MSE (UK) Ltd does not accept any responsibility for the operation of any such apparatus should it be connected to electricity supplies which are normally outside, or vary outside, the stated voltage and frequency values for which it is designed, nor for any consequential loss, damage or injury, howsoever caused.

MSE (UK) Ltd WARRANTY

Terms and Conditions

We hope that you do not have the need to use the extensive warranty cover that MSE (UK) Ltd extends to you. However should you have a problem, our prompt response is greatly helped if you have filled in and posted the pre-paid Warranty Registration Card supplied with your new equipment.

MSE (UK) Ltd gives a one-year warranty from the date of delivery. During this period, component parts proven to be defective in materials or workmanship will be repaired or replaced at our expense. Installation, commissioning and calibration are not covered by this warranty agreement. The MSE (UK) Ltd approved service agent must be contacted for warranty determination and direction prior to any work being carried out.

These warranties are only applicable to new products, and not second hand nor refurbished products even if repaired by MSE (UK) Ltd. Any such products are covered by separate warranty terms and conditions which will be made available on request.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or the component part beyond the original one year warranty period unless agreed in writing by MSE (UK) Ltd.

The above warranties are extended to the original purchaser upon full invoice payment. A purchase receipt or other proof of purchase may be required before warranty service will be performed. These warranties only cover failures due to defective workmanship which occur during the normal operation of the product by the original purchaser, and not failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, faulty installation, electrical power fluctuations, dust, or other environmental extremes, modification or service other than by an approved service agent or following the written authority of the manufacturer, or damage that is attributable to acts of God. Expendable items such as motor brushes, door seals, lid seals, "O" rings or lamps are excluded.

MSE (UK) Ltd., or its approved service agent, reserves the right to repair defective equipment on the premises of the customer, or at a service station, at the sole discretion of MSE (UK) Ltd or their approved agent. In the event of return to an approved service centre the customer is responsible for the safe packaging of the instrument and notification to the service centre. Neither MSE (UK) Ltd nor its agents are responsible for any damage occurring during shipment.

Specification and Material Changes: MSE (UK) Ltd reserves the right to supply our latest and improved models at time of shipment.

Taxes: The prices quoted do not include any taxes imposed by the State or Country in which the purchase was made.

Installation: Installation of all equipment shall be by, and at the expense of the purchaser unless stated otherwise. Access to the site, and the provision of required utilities e.g. Power, water and drainage to suitable connections, will be the responsibility of the purchaser, and at the purchaser's expense.

Limitation of liability: In no event, whether as a result of breach of contract or warranty, shall MSE (UK) Ltd be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of the equipment or any associated equipment, down time costs, costs of substitute equipment, costs of labour, costs due to delays or claims of purchaser's own customers for such damages. The purchaser agrees to indemnify MSE (UK) Ltd and to hold them harmless from any and all liability, claims, demands, actions, suits, expenses or costs, including attorney's fees relating to such consequential or incidental damages.

All expressed and implied warranties, including the warranties of merchantable quality and fitness for a particular purpose, are limited to the application period of one year.

Validity: Legal rights vary from country to country and states within countries, so some or all of the exclusions or limitations listed above may not apply, but if any part of these conditions shall be found to be unenforceable it shall not affect the validity or enforceability of the remainder of the conditions.

ELECTRICITY SUPPLY

Before connecting this apparatus to the electricity supply, check the information given on the rating plate and ensure that;

A) Your supply is single phase AC (alternating current) of the stated frequency with neutral nominally at earth potential.

B) Your supply voltage is within the stated range.

C) The current rating is within the capacity of your outlet.

D) Your plug or electricity supply circuit is fitted with a suitable fuse.

Fuse rating	**230v**	**110v - 120v**
	13 amp	15 amp

WARNING! This apparatus must be earthed.

The wires in the mains lead are coloured in accordance with the following code;

	230v	**110v - 120v**
Live	Brown	Black
Neutral	Blue	White
Earth	Green and Yellow	Green

Connect the wires to a non-reversible 3-pin plug as follows:

Green and Yellow or Green to terminal marked E (Earth), G (Ground), coloured Green or Green and Yellow or marked with the Earth symbol.

Blue or white wire to terminal marked N (Neutral) or Common or coloured Blue.

Brown or black wire to terminal marked L (Live) or Phase or coloured brown.

Note: 110v - 120v installations to comply with National and State Wiring Codes.

IMPORTANT Consult an electrician if in any doubt or if your supply system has any of the following:

No earth
A colour code different from above
Reversible plugs
Supply and return leads that are both above earth potential.

ILLUSTRATIONS

1. INTRODUCTION TO YOUR CENTRIFUGE

The HARRIER range of performance bench top centrifuges joins the well established range of MSE centrifuges.

The entire MSE range of centrifuges has been designed to meet the present and future demands of routine research laboratories.

A comprehensive range of rotors and accessories are available to accommodate the most commonly used centrifuge tubes and bottles.

In the HARRIER range, MSE have utilised the best of current technology to produce the most advanced, safe and reliable instrument possible.

Advanced design features include:-

- INTELLIGENT MICROPROCESSOR CONTROL
- LED DISPLAY / TACTILE CONTROL PANEL
- INVERTER CONTROLLED BRUSHLESS MOTOR
- AUTOMATIC ROTOR IDENTIFICATION SYSTEM
- LAST RUN RECALL
- OVERSPEED PROTECTION
- FULL LID INTERLOCK
- IMBALANCE MONITOR
- SELF DIAGNOSTIC DISPLAY
- SIMPLE TO USE
- EASY SERVICING
- KEY PAD LOCK
- *REFRIGERATION
- *PRE COOL FACILTY

* Harrier 18/80 Refrigerated only

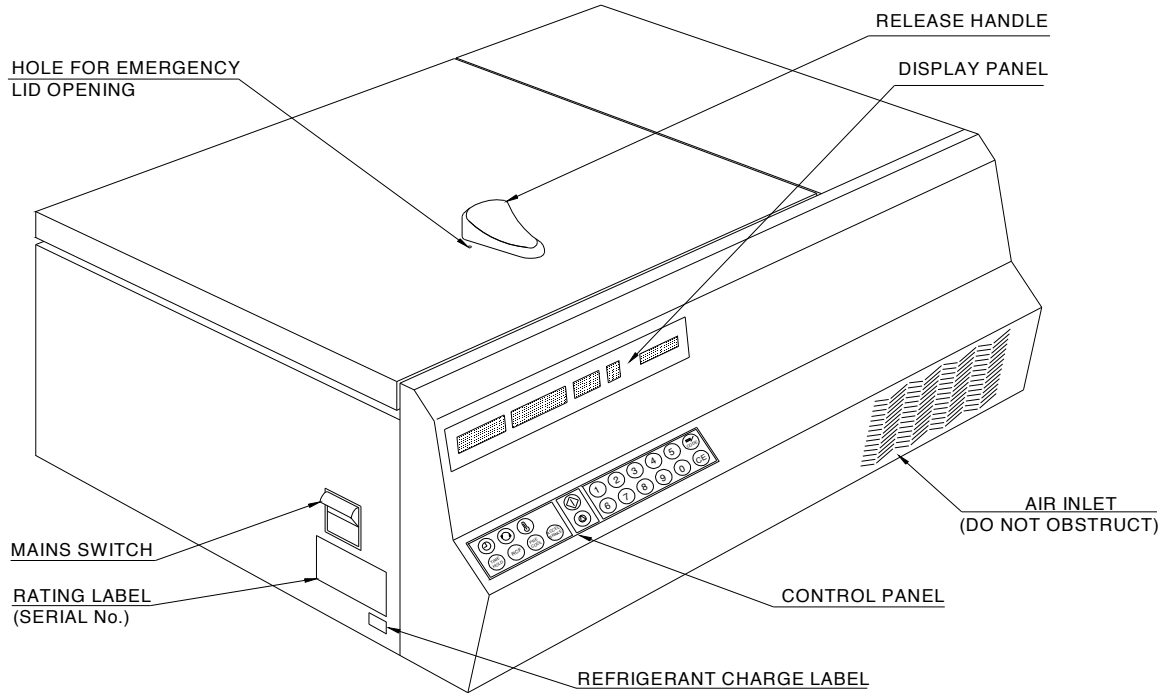


Figure 1 Front View (Refrigerated)

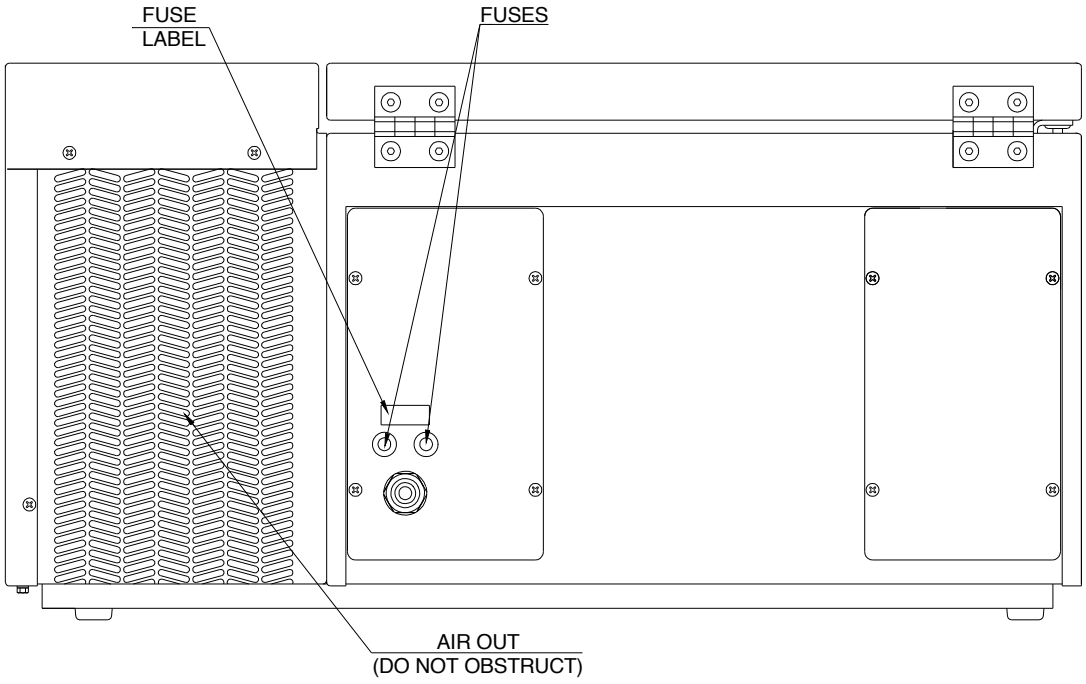


Figure 2 Rear View (Refrigerated)

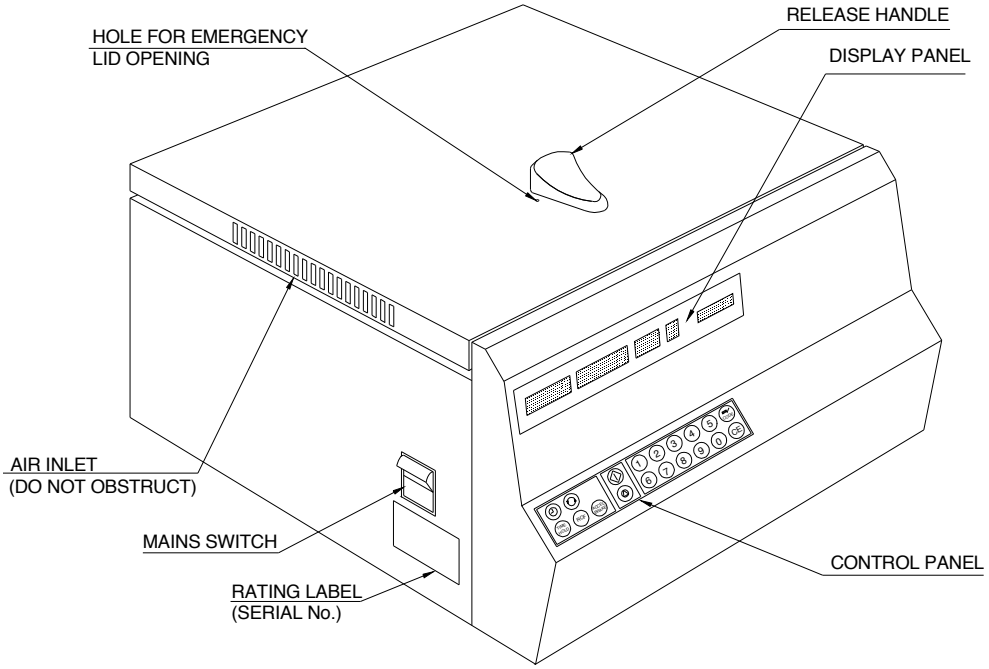


Figure Figure 3 Front View (Non Refrigerated)

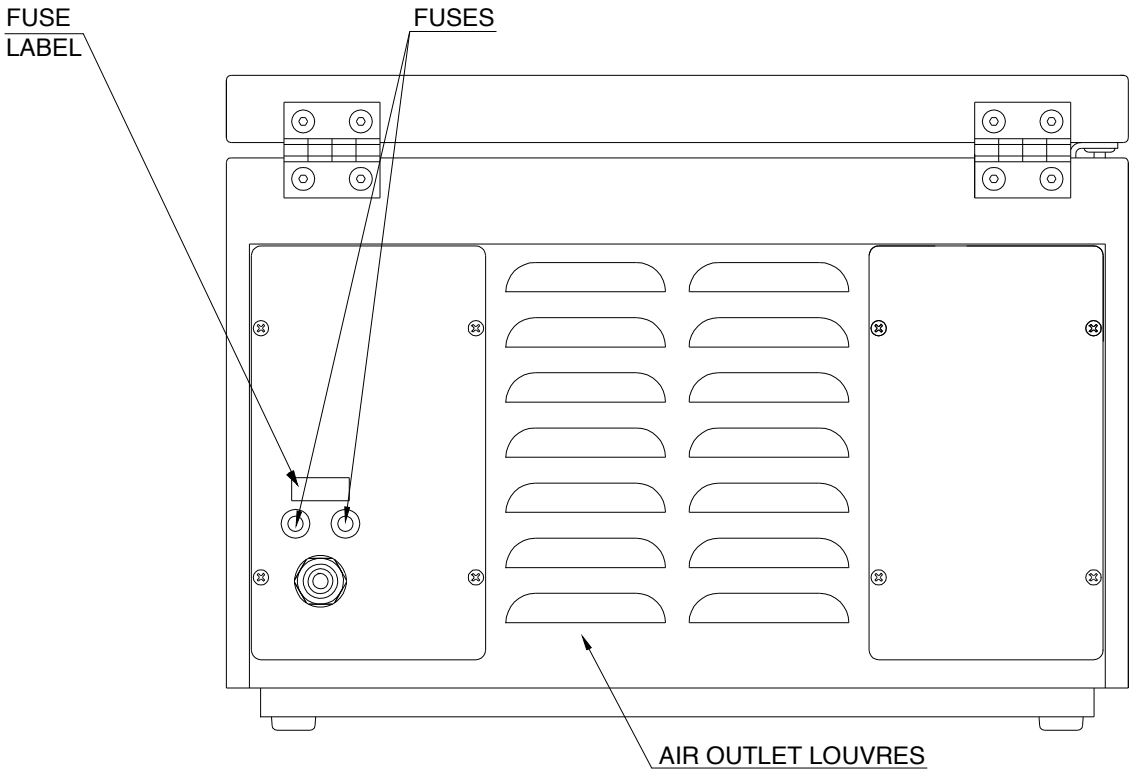


Figure 4 Rear View (Non Refrigerated)

1.1 Specifications

	Refrigerated	Non Refrigerated
Power supply options	120v 60Hz single phase 230v 50Hz single phase	120v 50/60Hz single phase 230v 50/60Hz single phase
Power consumption at full load (Acceleration power shown in brackets)	120v - 2000 watts (3000 watts) 230v - 800 watts (1600 watts)	120v - 1020 watts (1500 watts) 230v - 420 watts (1050 watts)
Time DISPLAY/RANGE	0 - 59 minutes 59 seconds 1 hour - 99 hours 59 minutes or Time Hold	1 hour - 99 hours 59 minutes or Time Hold
Timing Accuracy	0.1 second	0.1 second
Speed range	up to 18,000 rpm	up to 15,000 rpm
Speed control accuracy	± 10 rpm	± 10 rpm
Speed DISPLAY	± 20 rpm	± 20 rpm
Speed SETTING increments	1 rpm	1 rpm
RCF range	up to 28975g	up to 20154g
RCF SETTING increments	1g	1g
Temp range	0 to 40°C*	_
Temp accuracy	± 2°C	_
Pre cool	-9 to ambient	_
Acceleration rates	10 off	10 off
Brake rates	10 off	10 off
Dimensions	Height 340 mm Width 670 mm Depth 580 mm (not including mains cable) Weight 65 kg	Height 340 mm Width 470 mm Depth 580 mm (not including mains cable) Weight 41 kg
Standard operating conditions	Atmospheric pressure 950-1015 mbar (13.78 - 14.71 psi) Ambient temperature +10℃ to +35℃ Max. operating temperature +35℃ Humidity up to 70% RH	Atmospheric pressure 950-1015 mbar (13.78 - 14.71 psi) Ambient temperature +10℃ to +35℃ Max. operating temperature +35℃ Humidity up to 70% RH

*Temperatures lower than 0°C can be obtained, dependent on rotor, at maximum speed.

The Harrier Centrifuge range are CE marked in line with required European Directives for Electromagnetic and Low Voltage Compatibility, see “Declaration of Conformity” for EC directive/standard used.

120v units designed for CSA approval to the following standards:

CAN/CSA C22.2 No. 1010.1-92
CAN/CSA C22.2 No. 1010.2.020-94

INDEPENDENT SPEED SENSING - 120 volt Machines only
To comply with certain USA standards the 120 volt machines are fitted with a small window in the cover. This permits independent speed check directly from the rotor with use of an optically coupled tachometer.

2. INSTALLATION

Remove the centrifuge from its packaging and place it on a rigid, level surface. **DO NOT LIFT THE CENTRIFUGE BY IT'S LID.** The location of the keyboard, display, air inlet, lid lock access hole, and the release handle are shown in Figure 1 on page 8. The location of the serial number label, power switch and fuses are shown in Figure 2 on the same page.

IMPORTANT: THE ROTOR MUST NOT BE FITTED WHEN MOVING THE CENTRIFUGE OR DURING TRANSIT.

Check that the available power supply corresponds to that stated on the rating plate located at the rear of the instrument.

If the restraint kit (see “Centrifuge restraint”) is not used to secure the centrifuge on the bench then, it is the recommendation of BS EN61010-2-020 that a clearance of 300 mm is allowed around the base of the centrifuge when in the final operating position.

NOTE: Laboratory management procedures should require that no person or any hazardous materials are within a 300mm boundary while the centrifuge is operating.

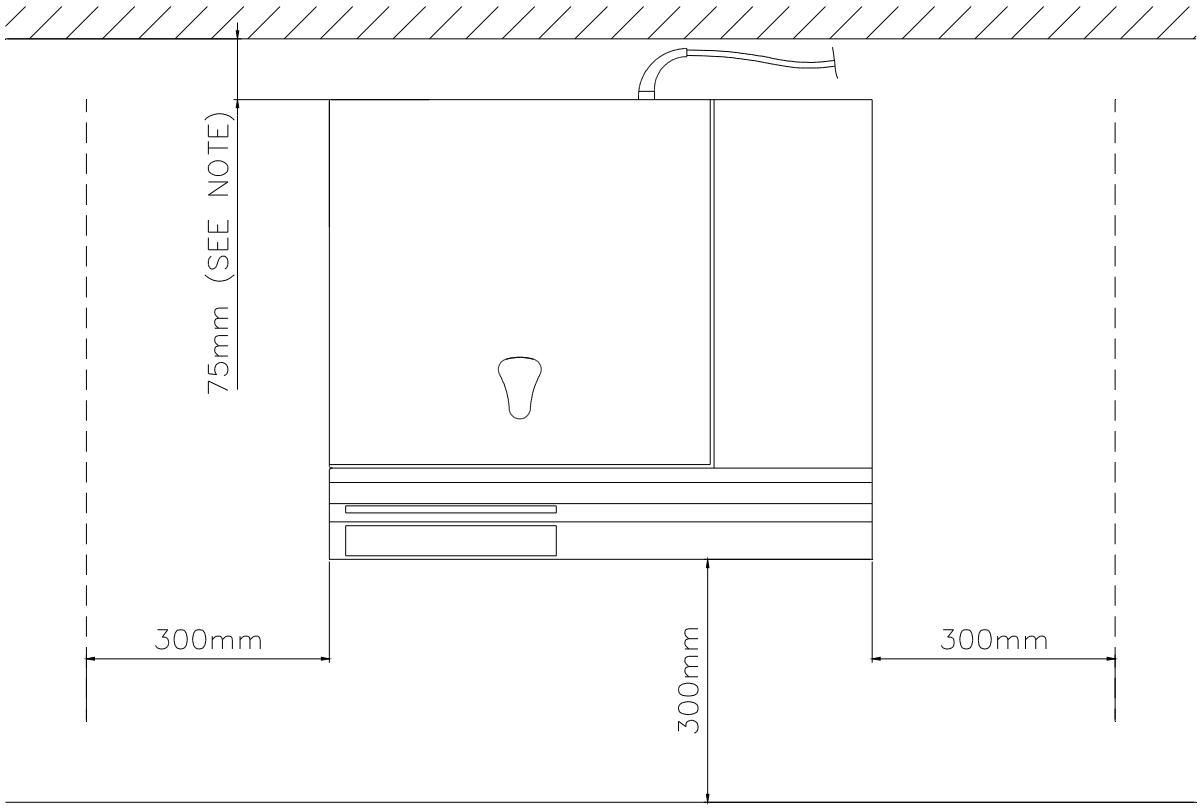


Figure 5 Recommended clearances

Note: 75mm if solid surface (i.e. wall) otherwise 300mm

2.1 Connecting the power supply

230v centrifuge - Connect the 3-core cable to a 3-pin plug, fitted with a 13 amp fuse.

Brown wire to Live (L) terminal
Blue wire to Neutral (N) terminal
Yellow/Green wire to Earth (E) terminal

NOTE: BS EN 61010-2-020 'Particular Requirements for Centrifuges' states that a remote switch, preferably adjacent to the room exit is a requirement in case of unit malfunction.

120v centrifuge - supplied with fitted plug.

2.2 Centrifuge restraint

A suggested restraint system (part number SG.66500.1214), which secures the centrifuge to a sound work surface, is shown in Figure 6. It consists of 4 anchor brackets, positioned at each corner of the centrifuge base, which are bolted or screwed to the work surface.

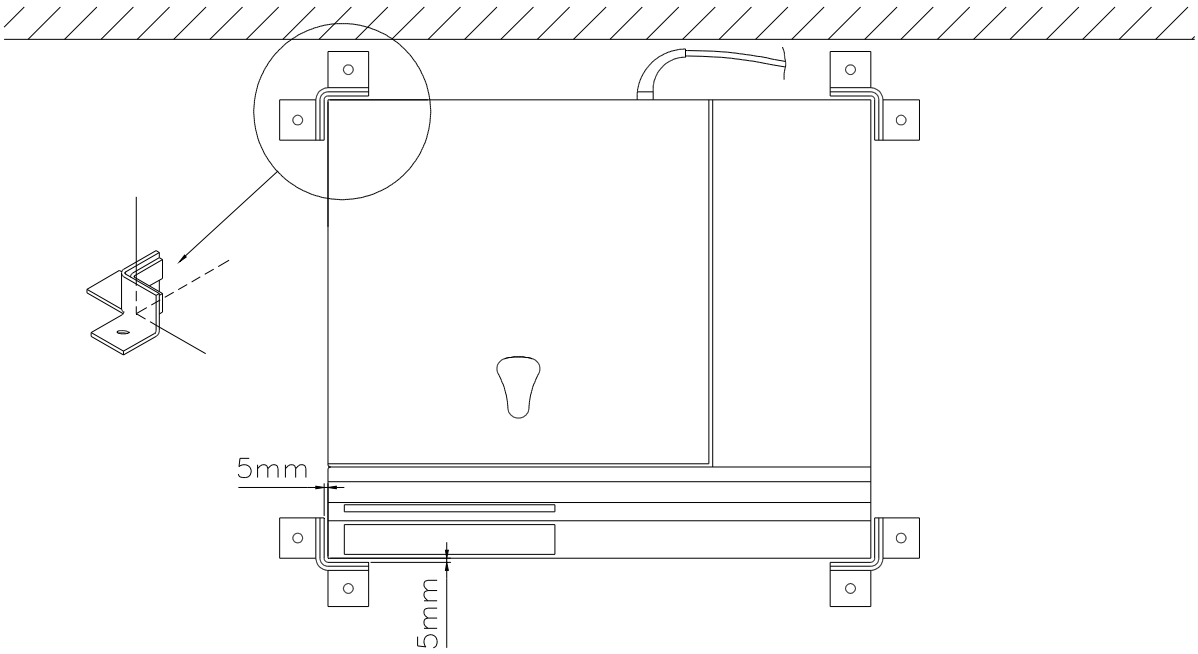


Figure 6 Suggested Restraint System

2.3 Accessories supplied with each centrifuge

Description	Quantity	Part No.
Emergency over-ride key	1	76600.004
Guarantee card 120v/230v	1	71100.1052/958
Operating manual	1	71100.1378
Box spanner	1	96500.384AD

3. GOOD OPERATOR PRACTICE

Please read the following notes before attempting to operate the centrifuge.

3.1 Spillage

In the event of a liquid spillage the affected surfaces should be cleaned immediately. The rotor and accessories should be removed for thorough cleaning. Regular cleaning of the centrifuge is highly recommended to avoid the build up of contaminants.

3.2 Materials with specific gravity in excess of 1.2

The maximum speed of each rotor is calculated on the basis of samples with a specific gravity of 1.2. If materials of a higher specific gravity are used, then the maximum rotor speed must be reduced according to the formula below.

$$M = \sqrt{\frac{1.2 \times N^2}{S}} \text{ RPM}$$

Where M = New maximum speed
N = Normal maximum speed
S = Specific gravity of sample

3.3 Corrosive materials

Where particularly corrosive materials are to be centrifuged, the samples should be placed in sealed containers and all necessary precautions observed. The following list gives examples of corrosive materials used in laboratories.

- Phenol/cresol/water
- Chloroform/isoamyl alcohol
- Salt solutions (especially ammonium sulphate)
- Solutions of ammonium hydroxide and acidic solutions e.g. hydrochloric, trichoracetic and perchloric acids.

Other materials may be equally corrosive, the user is responsible for checking the characteristics of substances used.

NOTE: The following materials are prohibited:

- Flammable or explosive materials
- Materials which chemically interact vigorously

3.4 Infective samples

Very special care is necessary when infective materials are to be centrifuged. Sealed containers should always be used. The caps should be double checked to ensure that they are not damaged and fit correctly prior to starting the centrifuge. After use containers and caps should be sterilised immediately using a non-corrosive method.

NOTE: Sealed containers and related components are intended to be part of bio safety systems such as are specified in international and national bio safety guide lines, and cannot be relied on as the only means of safeguarding workers and the environment when handling pathogenic micro-organisms.

3.5 Servicing

It is advisable to have this centrifuge serviced regularly by a competent engineer, preferably the manufacturer's representative, at least once per year.

4. THE DISPLAY AND CONTROL PANEL

The displays and keys on the control panel are labelled as follows:-

1. Run time display
2. Speed/RCF display - when displaying RCF values a point will be displayed in the bottom right hand corner
3. *Temp display
4. Accel/brake rate display

(Accel rate is only displayed when the value is set and while accelerating)

5. Status display
6. Run time key
7. Time hold key
8. Speed key
9. RCF key
10. *Temp key
11. *Pre cool key
12. Accel / brake rate key
13. Rotor start key
14. Rotor stop key
15. Numerical keys (for time, speed etc.)
16. Minus/code key
17. Cancel entry key

*Applies to Refrigerated models only

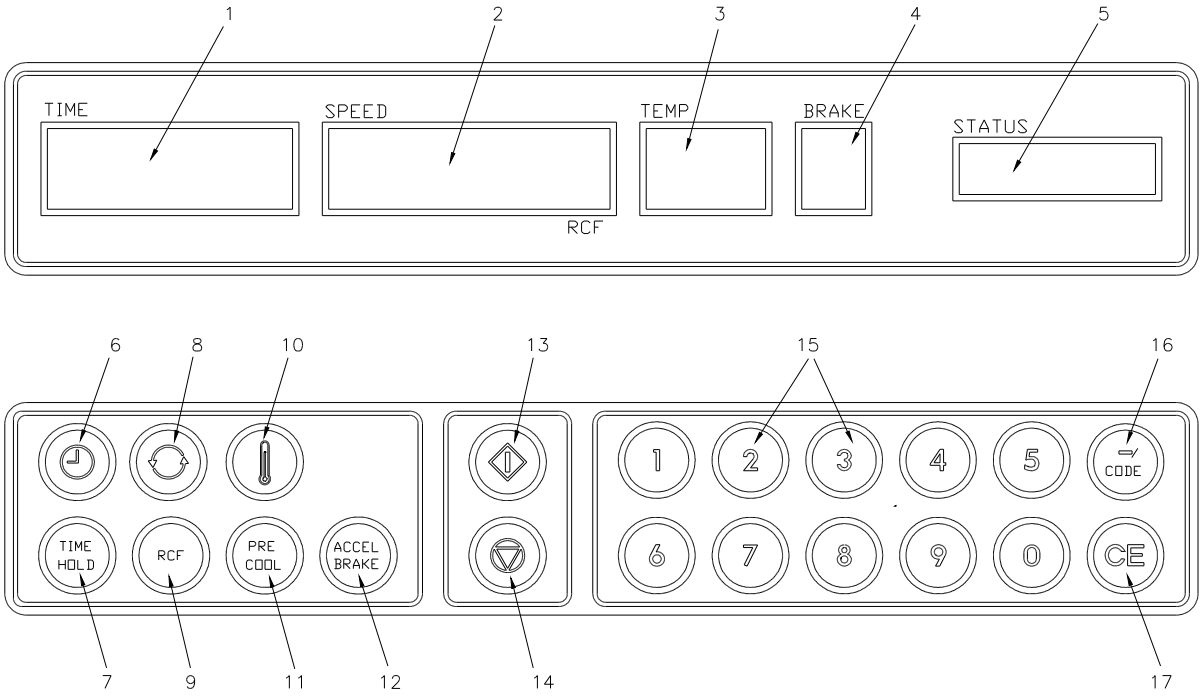


Figure 7 The display and control panel

5. HOW TO USE YOUR HARRIER CENTRIFUGE

Connect to the power supply. Press the power ON switch, -situated on the left hand side panel of the centrifuge (see Figures 1 & 3) - 0 = OFF, 1 = ON. The status display will become active and an audible signal will inform the user that the instrument is ready for use.

On power up the centrifuge will display the values which were current when the instrument was last switched off. An example of the display is shown below.

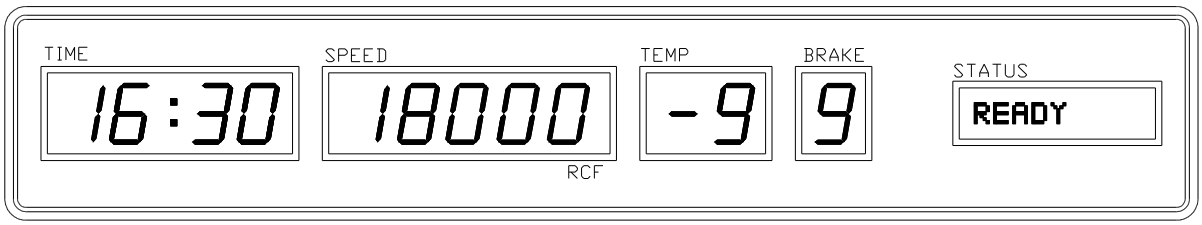


Figure 8 The display on power-up

5.1 Opening the lid

To open the lid push back the release catch on the top of the unit. The lid is supported by a gas strut and will open automatically.

5.2 Rotors and accessories

The tables in section **Error! Reference source not found.** list the range of rotors and accessories available for use with the Harrier centrifuge range.

When using any of the alternative rotors it would be advisable to rotate the rotor through 90°, 180°, and 270° to it's first location on the drive head to check for the quietist position when running at maximum speed. Mark the rotor label appropriately in line with the pre-printed dot on the drive head,

Before fitting a rotor ensure that the drive head and rotor bore are clean. Pay particular attention to the pivot pins of the swing-out rotors and the pockets in angle rotors.

5.3 Fitting the rotor

If the centrifuge has been supplied with a matched wind shielded rotor (MSB080.CR2.K and MSB080.CR2.H) ensure that when fitting the rotor the alignment marks (yellow dots) on the drive head and the rotor are lined up. Locate the rotor on the drive head and tighten the rotor nut firmly by using the spanner provided, while holding the rotor stationary.

DO NOT RUN THE CENTRIFUGE WITHOUT A ROTOR BEING FITTED TO THE DRIVE SHAFT. FAILURE TO COMPLY WITH THIS REQUIREMENT WILL CAUSE AN ERROR TO BE DISPLAYED.

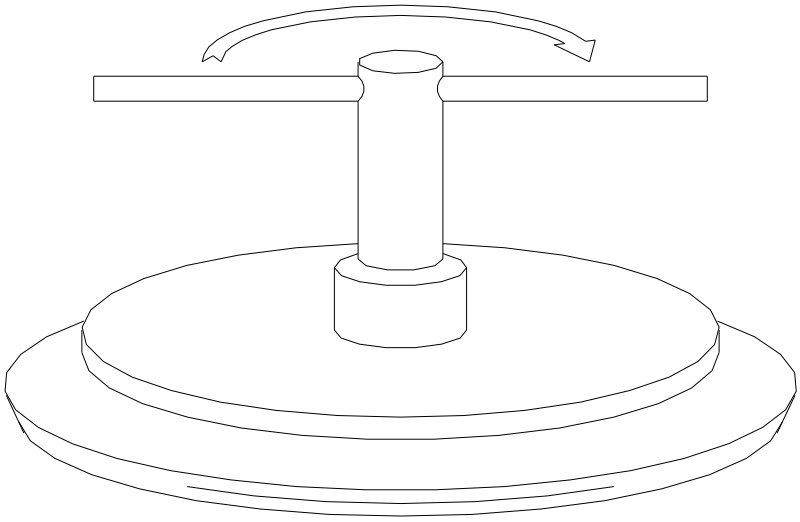


Figure 9 Tightening the rotor nut

5.4 Loading the rotor

Sealed rotors, buckets, cups and trunnions are supplied as matched, balanced assemblies. It is important that all components should be stored and used together. It is not necessary for all buckets to be loaded, provided that the loads are placed symmetrically around the rotor.

THE ROTOR MUST ALWAYS BE USED WITH A FULL COMPLIMENT OF BUCKETS

DO NOT RUN WINDSHIELDED ROTORS WITHOUT THEIR COVERS IN PLACE. FAILURE TO COMPLY WITH THIS REQUIREMENT COULD RESULT IN SERIOUS DAMAGE TO THE CENTRIFUGE.

CARE MUST BE TAKEN TO PREVENT DISTORTION OF WINDSHIELDED ROTORS.

LIFT THEM BY GRASPING THE ARMS OF ROTOR SPIDER AND NOT BY THE WINDSHIELD.

WARNING: RIA ROTOR LOADINGS **MUST** BE EVENLY DISTRIBUTED ABOUT PIVOT POINT OF EACH CARRIER. SEE LEAFLET SUPPLIED WITH ROTOR DO NOT RUN THE RIA ROTOR WITHOUT THE CARRIERS IN PLACE.
If using a swing-out rotor, check that all cups/buckets are correctly located on their pivot pins by ensuring that they swing freely.

Refer to the chapter headed “Good Operator Practice” on page 14 for centrifugation of samples with the following characteristics:-
Specific gravity in excess of 1.2
Corrosive materials
Infective samples

5.5 Balancing the rotor

The loads should be reasonably balanced, which, in most cases, means equalising the liquid levels by eye. In the swing out rotor do not exceed 5 grams between loads when fully or partially loaded.

When loading trunnion carriers (Cat.No.34136.110 and buckets 43156.603) the following procedure should be adhered to:-

1) Weight group the buckets to within 5g.

2) Weight group the trunnion block and buckets as an assembly to within 5g.

Failure to load the rotor carefully may trip the out-of-balance sensor, causing the instrument to stop, in this case the status display will show “IMBALNCE”. An unbalanced rotor will make the centrifuge vibrate and it will be noisy in operation.

5.6 Removing the rotor

Open the lid. Remove all the buckets and trunnions. Using a suitable bar inserted through the hole in the spindle nut, unscrew and remove the spindle nut. Grip the rotor on opposite sides and lift it clear of the drive head.

NEVER USE EXCESSIVE FORCE.

5.7 Closing the lid

Once you have loaded the rotor close the lid and push it firmly down. You will hear a ‘click' this means that the lid has locked down securely. The status will read “READY” and the run may be started.

5.8 Parameter entry

The current parameters are shown in the display windows. To start the machine with the current parameters press ⟐ (start).
To alter the parameters press the relevant keys as described below. The parameters can be changed in any order.

5.8.1 Entering run time

To change the run time press the 🕘 (time) key. The time display will flash, and the status will read “SET HOURS”. Enter the number of hours and press 🕘 again. The status will now read “SET MINS”. Enter the number of minutes and press 🕘 again. If zero hours was selected the status will read “ SET SEC”, enter the number of seconds and press 🕘 again. The display will stop flashing and will read “READY”. If an error is made at any stage, press CE and re-enter the time.

N.B. The maximum time that can be entered is 99 hours and 59 minutes or 99 minutes and 59 seconds. An error will be produced if the time entered is too great, i.e. a time greater than 59 seconds.

5.8.2 Time hold

If the unit is not required to run to a specific time press the **TIME HOLD** key, the time display will read “hold”. To revert back to a timed run press time hold again. On time hold the unit will run for 99 hours 59 minutes before stopping. It can be manually stopped at any time by pressing the ⊽ (stop) key.

5.8.3 Entering speed (RPM)

To change the speed, press the ⟳ (speed) key. The displayed speed will flash and status will read “SET SPEED”. Enter the required speed. If a mistake is made press CE, the display will clear and the new speed can be entered. Once the correct speed is entered press the ⟳ key again, the display will stop flashing and the status will revert back to ”READY”.
While the machine is running in RPM mode the RCF value can be displayed for 5 seconds by pressing the RCF key.

5.8.4 Entering an RCF value

To change the RCF value press RCF. Speed/RCF display will flash and the status will read “SET RCF”. Enter the required RCF value. If a mistake is made press CE, the display will clear and the new RCF value can be entered. Once the correct RCF value is entered press the RCF key again, the display will stop flashing and the status will revert back to ”READY”.

While the machine is running in RCF mode the RPM value can be displayed for 5 seconds by pressing the Speed key.

N.B. Each rotor has a maximum speed (and RCF value). If the operator selects a value in excess of this the unit will reduce the value to the maximum limit once the rotor has been identified.

5.8.5 Entering Temperature

To change the temperature press the ⏀ (temperature) key. The displayed temperature will flash and the status will read “SET TEMP”. Enter the required temperature. If an error is made, press CE, the display will clear and the new temperature can be entered. Once the correct temperature is entered press the ⏀ key again. The display will stop flashing and the status will revert to “READY”.

5.8.6 Pre-cool

To pre-cool the rotor and samples, fit the rotor and load the samples as outlined in Section 5.4. Close the lid and press down firmly to engage the lid lock. Press the pre-cool key. The status display will read “PRECOOL”.

5.8.7 Entering acceleration and brake rate

To change the acceleration and brake rate press the **ACCEL/BRAKE** key. The brake display will flash and read “SETACCEL”. Enter the acceleration rate and press ACCEL/BRAKE again. The display will read “SETBRAKE”. Enter the brake rate. If an error is made press CE and re-enter the value. Once the correct values have been entered press ACCEL/BRAKE again, and the display will stop flashing. The status will read “READY”.

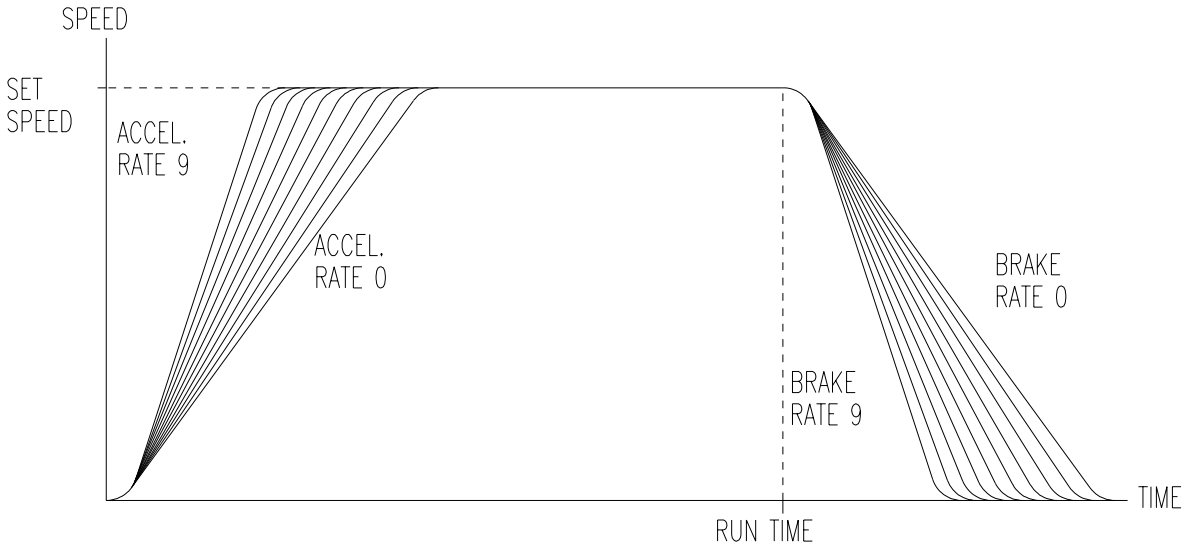


Figure 10 Acceleration and brake rate curves

5.9 Starting the run

Ensure that the rotor is correctly loaded and fitted. Close the lid and press down firmly to engage the lid lock. Press the rotor start key. The display will now change to show actual values of speed, run time and brake rate. During the run the status display will read “ROTOR ID”. The status of the unit is ramp up at speed and stopping. At the end of the run an audible bleep will be heard.

5.10 Code Key

The code key can be used to lock and unlock the key pad. To do this press the code key. The status will display “CODE” press 1, 2 & 3. The status will read “LOCKED”. When the keypad is locked only the Start and Stop keys will operate.

The code key can also be used to change the language displayed in the status window. To do this press the code key followed by the appropriate code as shown below:

000 for English	004 for Portuguese	008 for Hungarian
001 for French	006 for Danish	009 for Romanian
002 for German	007 for Turkish	010 for Estonian

5.11 Manual termination of run.

At any time the run may be stopped by pressing the ⏚ (STOP) key.

5.12 Opening the lid if there is a power failure

It will not be possible to open the lid by the normal method of pushing the release handle if there is a power failure, or if the lid lock has been deliberately disabled by the control system for safety reasons. The procedure below should be followed in these circumstances:-

1. Switch the centrifuge OFF - WAIT 5 MINUTES TO ENSURE THE ROTOR HAS STOPPED.
2. Insert the emergency over-ride key into the small hole near the release handle, (see Figure 1 page 8).
3. Move the key as shown in Figure 11 below to move back the lid lock solenoid.
4. With the lid lock solenoid dis-engaged, push back the release handle and the lid will open normally.

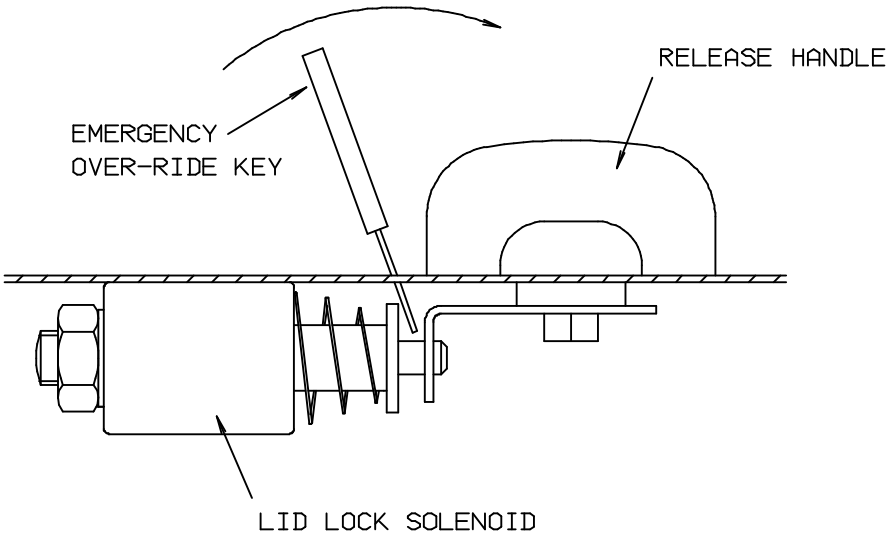


Figure 11 Lid lock override method (viewed from front)

6. ERROR MESSAGES

Any error message is intermittently displayed in the status display. The display is accompanied by an audible alarm.

Refer to the error message table for a full explanation of each message and the correct course of action.

IMPORTANT:- ENSURE THAT THE AIR INLET AND OUTLET ARE NOT OBSTRUCTED IN ANY WAY.

Should the display show an error message which then cannot be cleared or re-occurs after clearing then the power supply should be disconnected and the service engineer called.

6.1 Error message table

NOTE: If an error is not rectified by taking the suggested action, if it is erratic or persists without apparent cause, disconnect the power supply and contact the service engineer.

ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
INVALID	The parameter entered is not valid i.e. minutes >59	Machine will not run	1. Press CE to clear error 2. Re-enter parameter
BAD ID	Rotor has not been identified or rotor not fitted	Machine will stop Error cannot be cancelled until motor has stopped turning	1. Press CE and open lid 2. Check rotor has been fitted 3. Remove rotor, clean drive head and top surface of motor 4. Clean and inspect rotor bore and underside of rotor
BADROTOR	Rotor identified should not be fitted to machine	Machine will stop Error cannot be cancelled until motor has stopped turning	1. Check that the rotor is correct for the machine 2. Remove rotor, clean drive head and top surface of motor 3. Clean rotor bore and underside of rotor 4. Check rotor magnets are not missing or damaged
SET>MAX	The speed set is greater than is allowed for rotor	Machine will run at maximum speed for rotor	1. Press CE to clear error 2. Reset speed once run has ended
IMBALNCE	Rotor assembly is not balanced within allowable limits	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Ensure rotor buckets pivot freely 3. See 5.4 **Loading the rotor** and 5.5 Balancing the rotor 4. Remove rotor and clean drive head and rotor bore

ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
UNLOCKED	Malfunction of lid lock mechanism or interlock switch	Machine will stop Lid lock will prevent normal lid operation	1. Open lid (if lid is locked follow procedure on page 22) 2. Remove rotor 3. Disconnect from power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
SPEED +-.	Set value has been exceeded	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
SPEED -	Set value has not been achieved	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
HOT MOTOR	Motor has overheated	Machine will stop Error cannot be cancelled until the rotor has stopped turning Thermostat will reset once the motor has cooled	1. Press CE and open lid 2. Ensure that the inlet and outlet vents are not blocked

ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
NO TACHO	Fault in tacho signal	Machine will stop Lid lock will prevent normal lid operation	1. Wait for 5 minutes or until the rotor has stopped turning 2. Follow the procedure on page 22 for opening the lid 3. Remove the rotor 4. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
BAD STOP	Rotor is stationary when it should be running	Machine is stationary	Press CE
POW FAIL	There has been an interruption of the power supply to the machine	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Check power supply
SER TOUT	Inverter is not responding to the software	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect from power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER

ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
BAD CHKS	Link to inverter is not functioning	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect from power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
BAD MEM	Software memory problem	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect from power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
FRAME	Software data not correctly synchronised	Machine will stop Error cannot be cancelled until the rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect from power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
LID OPEN	Lid is open during Pre-cool	Machine will keep running	1. Close lid 2. Press CE

ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
OVER 45°	Bowl temperature is over 45°C	Machine will stop	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
BAD THERM	Malfunction of temperature sensor	Machine will stop Error cannot be cancelled until rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
HOT COMP	Compressor has over-heated	Machine will stop Error cannot be cancelled until rotor has stopped turning	1. Press CE and open lid 2. Ensure that the air filter and inlet vents are not blocked
TEMP LOW	Set value has been exceeded	Machine will stop Error cannot be cancelled until rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER
TEMP HIGH	Set value has not been achieved	Machine will stop Error cannot be cancelled until rotor has stopped turning	1. Press CE and open lid 2. Remove rotor 3. Disconnect the power supply DO NOT USE THE MACHINE UNTIL IT HAS BEEN CHECKED BY A SERVICE ENGINEER

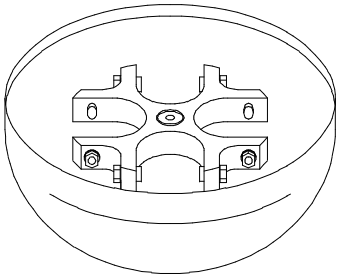
ERROR MESSAGE	EXPLANATION	EFFECT ON MACHINE	OPERATOR ACTION
LID BAR	Lid has been depressed	Machine will stop	1. Press CE and allow machine to stop. 2. Switch off, to reset machine.0

7. ROTORS AND ACCESSORIES

The following pages contain tables listing the rotors and accessories which are available for use with your Harrier centrifuge.

7.1 4 X 200 Windshield Swing Out Rotor - for use with Harrier 18/80 refrigerated only

MSE 43124-141 .6000 rpm (max. speed)



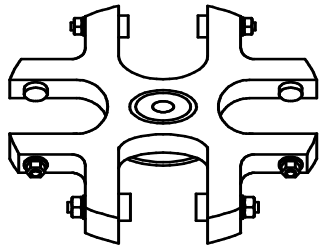
Accessories

200ml sealed bucket (43551-1215)
DO NOT RUN WITH ANY OTHER BUCKETS

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No..				Radius (mm)	RCF x g	Dia (mm)	Length (mm)
4 x 200ml	-	-	200ml bottle 43551-103	-	-	160.4	6455	57.7	120.2
4 x 100ml	Brown	34159-302	-	-	-	160.5	6466	39	113
4 x 50 10z	Yellow	34159-301	-	-	-	160.5	6466	29	113
28 x 15ml	Green	34159-304	-	-	-	160.5	6466	17	110
28 x 15ml	Black	34159-308	-	-	-	158	6359	17	107
16 x 5/10ml	Grey	34159-303	-	-	-	159	6400	16.7	105
48 x 12mm	Blue	34159-306	-	-	-	160.5	6466	12	110
36 x 13mm	Orange	34159-305	-	-	-	160	6439	13	110
1 x 50ml	Beige	34159.309	-	-	-	160.5	6466	29	74
3 x 15ml	Maroon	34159.310	-	-	-	160.5	6466	17	90

7.2 4 x 200 Swing out rotor - for use with Harrier 15/80 only

MSE 43124-134 .4500 rpm (max. speed)



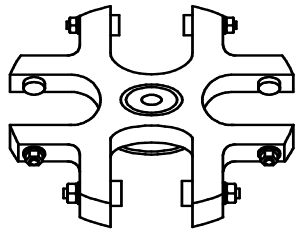
Accessories

200ml sealed bucket (43551-121)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat.No..				Radius (mm)	RCF x g	Dia (mm)	Length (mm)
4 x 200ml	-	-	200ml bottle 43551-103	-	-	160.4	3631	57.7	120.2
4 x 100ml	Brown	34159-302	-	-	-	160.5	3637	39	113
4 x 50 10z	Yellow	34159-301	-	-	-	160.5	3637	29	113
28 x 15ml	Green	34159-304	-	-	-	160.5	3637	17	110
28 x 15ml	Black	34159-308	-	-	-	158	3577	17	107
16 x 5/10ml	Grey	34159-303	-	-	-	159	3600	16.7	105
48 x 12mm	Blue	34159-306	-	-	-	160.5	3637	12	110
36 x 13mm	Orange	34159-305	-	-	-	160	3622	13	110
4 x 50ml	Beige	34159.309	-	-	-	160.5	3637	29	74
12 x 15ml	Maroon	34159.310				160.5	3637	17	90

7.3 4 x 200 swing out rotor - for use with Harrier 15/80 only

MSE 43124-134.4500 rpm (max. speed)



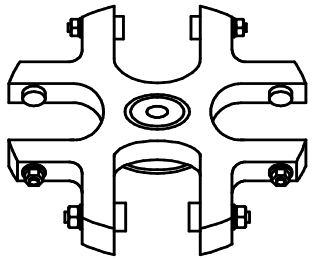
Accessories

2-place 50ml trunnion (34136-109)
50ml spherical end bucket (MSE 43156-602) sealed cap assembly (43561-162A)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No.				Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
8 X 50ml	-	-	50ml glass 34411-822	-	34142-104	140	3170	29	109
			50ml polypropylene 34411-154	-	-	148	3351	29	116
			50ml polycarbonate 34411-158	-	-	148	3351	29	116
			50ml glass 34411-821	-	34142-104	140	3170	29	109
8 X 15ml	-	34144-307	15ml glass 34411-815	34431-402	-	140	3170	17	107
			5 ml polypropylene 34411-131	34431-603	-	139	3147	17	107
			15ml Polycarbonate 34411-133	34411-603	-	139	3147	17	107

7.4 4 x 200 Swing out rotor - for use with Harrier 15/80 only

MSE 43124-134 .4500 rpm (max. speed)



Accessories

2-place 50ml trunnion (34136-110)
50ml sealed falcon bucket (43156-603)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat.No.				Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
8 x 50	-	-	50 ml falcon tube	-	34142-110	104	4185	29.5	120

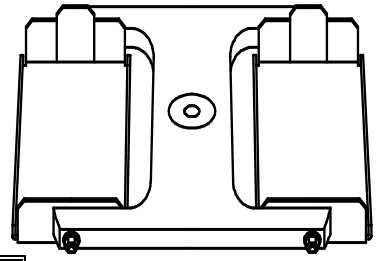
Accessories

4 x 50ml universal bucket (43551-125)

ADAPTOR			TUBE	CAP	CUSHION	OPEN BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat.No.				Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
16 X 50ml	-	-	50ml Universal	-	-	146	3305	28	95

7.5 Micro titration Rotor

MSE 43121-117.2600 rpm. (max. speed)



Accessories

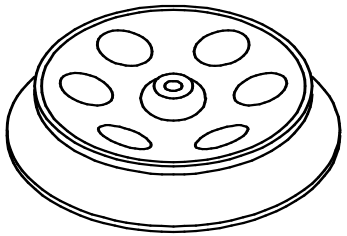
Support tray (96500-345)

MID TRAY		CORNER TRAY		NO. OF PLATES
Radius (mm)	RCF x g	Radius(mm)	RCF x g	
113	854*	130	982*	4 (2 per carrier)

*Check with the plate supplier on the max. RCF x g value

7.6 6 X 50 Angle Rotor

43117-608. 6500 rpm.



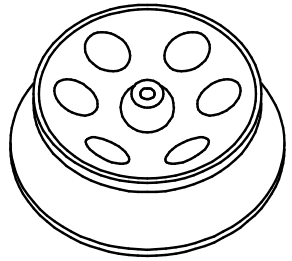
Accessories
50ml Spherical end bucket (43156-602)
Sealed cap assembly (43561-162A)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		OPEN BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No.				Radius (mm)	RCF x g	Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
6 x 15 ml	-	34144-307	15ml glass 34411-815	34431-402	34142-101	109	5149	110	5196	17	108
			15ml polypropylene 34411-131	34431-603	-	109	5149	111	5243	17	108
			15ml polycarbonate 34411-133	34431-603	-	109	5149	111	5243	17	108
			15ml glass conical 34411-813	34431-402	43161-103	-	-	106	5007	17	115
			15ml glass conical graduated 34411-814	34431-402	43161-103	-	-	106	5007	17	115
6x	Grey	34141-114	1 oz glass Universal	-	-	102	*4818	105	*4960	29	84

*Check with the tube supplier on the max. RCF x g value

7.7 6 X 50 Angle Rotor Continued

43117-608. 6500 rpm.



Accessories

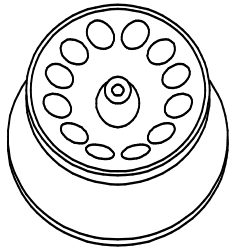
50ml Spherical end bucket (43156-602)
Sealed cap assembly (43561-162)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		OPEN BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No.				Radius (mm)	RCF x g	Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
6x	-	34141-115	sterilin	-	-	106	5007	109	5149	29	90
6x50 ml			50ml glass	-	34142-104	111	5243	112	*5290	29	110
			34411-822	34431-403		-	-	112	*5290	29	120
			50ml polypropylene 34411-154	-	-	116	5479	118	5574	29	116
				34431-605		-	-	118	5574	29	130
			50ml polycarbonate 34411-158	-	-	116	5479	118	5574	29	116
				34431-605		-	-	118	5574	29	130
			50ml glass conical 34411-818	34431-403	34148-705	-	-	107	*5054	29	115
			50ml glass conical graduated 34411-821	-	34142-104	111	5243	112	*5290	29	110
				34431-403		-	-	112	*5290	29	120

*Check with the tube supplier on the max. RCF x g value

7.8 12 X 15 Angle Rotor

43117-607.6500 rpm.



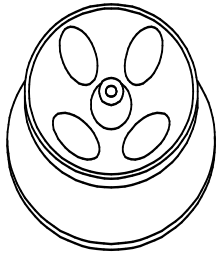
Accessories

15ml Spherical end bucket (43156-601)

ADAPTOR			TUBE	CAP	CUSHION	OPEN BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No.				Radius (mm)	RCF x g	Dia. (mm)	Length (mm)
12x15 ml	-	-	15ml glass 34411-815	34431-402	34142-101	109	*5149	17	108
			15ml polypropylene 34411-131	34431-603		112	5290	17	120
			15ml polycarbonate 34411-133	34431-603		112	5290	17	120
			15ml glass conical 34411-813	34431-402	43161-103	107	*5054	17	108
			15ml glass conical graduated 34411-814	34431-402	43161-103	107	*5054	17	108

*Check with the tube supplier on the max. RCF x g value

7.9 4 X 50ml Falcon Angle Rotor



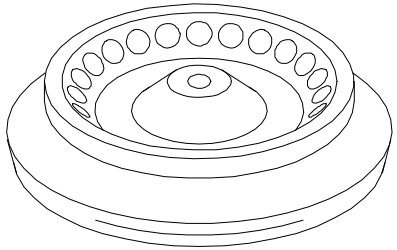
43117-609.6500 rpm.

Accessories
50ml Sealed falcon bucket (43156-603)

ADAPTOR			TUBE	CAP	CUSHION	SEALED BUCKET		MAX. TUBE SIZE	
Capacity	Colour	Cat. No.				Radius (mm)	RCF x g	Dia. (mm)	Length
4 x 50ml	-	-	50ml falcon tube	-	34142-110	104	4912	29.5	120

7.10 24 X 1.5ml Angle Rotor

43117-612.18000 rpm.



Accessories

1.5ml Disposable tubes (1000 off 43551-602)

Harrier 18/80 Refrigerated - 18000RPM

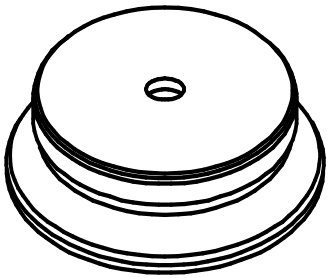
TUBE	Radius (mm)	RCF x g (max)	MAX. TUBE SIZE	
			Dia.(mm)	Length
1.5ml Disposable	80	28975	10.5	40

Harrier 15/80 (Air cooled) - 15000RPM

TUBE	Radius (mm)	RCF x g (max)	MAX. TUBE SIZE	
			Dia.(mm)	Length
1.5ml Disposable	80	20154	10.5	40

7.11 24 X 1.5ml Sealed Angle Rotor

43117-612 18000 rpm.



Accessories

Lid(43117-614).
1.5ml Disposable tube (1000 off 43551-602)
'O' rings for cover (77050.165 outer, 77050.166 inner)

Harrier 18/80 Refrigerated - 18000RPM

TUBE	Radius (mm)	RCF x g (max)	MAX. TUBE SIZE	
			Dia.(mm)	Length
1.5ml Disposable	80	28975	10.5	40

Harrier 15/80 (Air cooled) - 15000RPM

TUBE	Radius (mm)	RCF x g (max)	MAX. TUBE SIZE	
			Dia.(mm)	Length
1.5ml Disposable	80	20154	10.5	40

8. MAINTENANCE

This section describes the basic maintenance procedures, in particular, the methods and materials used for cleaning the centrifuge, rotors and accessories.

To ensure reliability and safety it is recommended that a inspection of the centrifuge is made after 1000 hours of operation, or at least once per year whichever is the sooner, this should include rotors and accessories.

Electricity at Work Regulations (1989). Portable Appliance Testing (PAT) - where applicable this centrifuge should be inspected and tested regularly in accordance with these regulations and the appropriate records kept.

For Warranty Service and Maintenance please see the details given at the front of this manual.

8.1 Cleanliness

To maintain a good appearance and to prevent dirt build-up, the casing and the inside of the bowl should be cleaned regularly using a soft cloth dampened with a neutral detergent and warm water. The control panel and display may also be cleaned in this manner, but should be wiped dry immediately.

If corrosive materials are used in the centrifuge, it is especially important to clean out the centrifuge bowl thoroughly. If a major spillage occurs in the bowl, the excess liquid should be mopped out and the bowl then cleaned using a suitable cleaning agent.

8.2 Drive shaft

The drive shaft should be cleaned periodically with a solvent to remove excessive grease. When clean, re-lubricate the shaft lightly with petroleum jelly.

8.3 Rotors and buckets

The rotors and accessories should be handled with care to avoid damage. Prior to storage, all components should be protected against corrosion using MSE Rotor Spray (Cat No. 17341-1512) which is an anti-corrosion and de-waterizing agent.

The rotors, metal buckets, cups, carriers and adaptors should all be washed after use with a neutral detergent and afterwards dried and stored in a dry place. Buckets and cups should be stored inverted.

The pivot areas of the swing-out rotors, i.e. the pivot pins on the rotor and the slots on the buckets, should be lubricated periodically with Molykote 321 R anti-friction coating (a spray can is the most convenient application method).

8.4 O-Rings

Ensure that the O-Rings fitted to the sealing caps and covers are lightly coated with silicone grease. Check the O-Rings regularly for cuts and abrasions, replacing as necessary but at least once a year.

8.5 Sterilisation

All of the rotors, buckets and sealing caps (with O-Rings removed) may be sterilised by autoclaving at 120℃.

DO NOT autoclave any parts where the protective finish is scratched or damaged.

8.6 Disinfecting

The following cleaning fluids may be used

TERMINEX 2 (available from Arrow Chemicals Ltd.)
VIRKON (available from Antec International)

These cleaning agents if used as instructed by the manufacturer should not be harmful to this centrifuge, or accessories supplied for use with it.

WARNING !
SOLVENTS OR GRITTY CLEANERS SHOULD NEVER BE USED
EXCESSIVE USE OF WATER SHOULD ALSO BE AVOIDED

If the means available for disinfection of certain microbiological agents are inadequate, the safety officer should be consulted and appropriate steps taken.

8.7 Lid seal.

Lightly coat the lid seal with French chalk occasionally and in particular after cleaning. If the lid seal becomes damaged it should be replaced by the service engineer.

8.8 Replacing the fuse

TO BE CARRIED OUT BY A QUALIFIED ELECTRICIAN ONLY.

The main power supply incorporates a fuse protection on both the live and the neutral connections, the locations of the fuses are shown in Figure 2 on page 8. The main connection plug on the 230v instrument should also be fitted with a fuse.

The appropriate fuse ratings are as follows:-

Voltage	Harrier 15/80 (air cooled)	Harrier 18/80 Refrigerated
120v	15 amp (6.3 x 32mm)	15 amp (6.3 x 32mm)
230v	5 amp (5 x 20mm)	10 amp (6.3 x 32mm)
230v plug	7 amp (1/4" x 1")	13 amp (1/4" x 1")

If one or both of the fuses have blown, and the centrifuge is switched on, the display will not function.

To replace the centrifuge fuse proceed as follows:-

1. **Disconnect the power supply at the main plug.**
2. Move the centrifuge to gain access to the rear,
3. Release the fuses using a flat head screwdriver. Inspect and replace as necessary with the correct rating. For 230v model, the plug fuse may also need to be checked.

NB - If the fuse blows immediately or blows again during normal use, the power supply should be disconnected and the service engineer called.

9. Product Disposal - ISO 14001 Compliance

This product should be treated as industrial waste and disposed of accordingly. There are no toxic material used in the manufacture of this product. The majority of materials used in this product are recyclable, and all can be disposed of safely. Where the product has refrigeration, it is important that prior to disposal the refrigerant gas is recovered by a qualified person. The insulation material is non-toxic but could be an irritant. If removed from the product it should be bagged and disposed of at an authorised site.

10. HOW TO OBTAIN SERVICE ON YOUR HARRIER CENTRIFUGE

MSE (UK) Ltd are committed to giving our customers the best possible service. If your centrifuge should require service at any time please follow these procedures: -

All countries except UK, USA and CANADA: Contact your local MSE (UK) Ltd distributor.

UK only: For all technical and service enquires contact::

MSE (UK) Ltd
Worsley Bridge Road
Lower Sydenham
London
SE26 5AZ
Phone : +44 (0) 870 609 4097
Fax: +44 (0) 208 650 8408
Email: sales@mseuk.co.uk

1. Contact the repairs centre - have the model, serial number, and date of purchase and fault description available.
2. You will be given a return goods authorisation number and directions for shipping.
3. Remove all rotors, buckets and adapters. Do not ship these items - only the centrifuge.
4. Thoroughly clean and disinfect the centrifuge.
5. Fill out the attached service request form and place inside the centrifuge.
6. Pack in a protective box (preferably that in which the centrifuge was originally supplied).
7. MSE (UK) Ltd will specify the carrier to be used and will give details of how the freight is to be charged.

CENTRIFUGE SERVICE REQUEST FORM

Should it become necessary to have your MSE centrifuge repaired, please take a few moments to fill out this form, which will help us to ensure you receive the best and fastest service possible.

Model	Refrigerated / Non refrigerated
Serial number: (on plate at back of unit)	.....
Date purchased:	.....
Where purchased:	.....
Brief description of fault: (Error message displayed)	.....
	.....
	.....
Date fault first occurred:	.....
Date repair centre contacted:	.....
Authorisation number:	.....
Condition of centrifuge:	.....
Has it been disinfected?	Yes / No
Disinfectant used:	.....
Contact name:	.....
Address:	.....
	.....
	.....
Telephone Number:	.....

Signature: .....